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### Genetic Counseling in India: A Bibliometric Study

O Priya Singha

*Assam University, Silchar, India*, [priyasingha668@gmail.com](mailto:priyasingha668@gmail.com)

Dhan Maya Chetry

*Assam University, Silchar, India*, [maychet31@gmail.com](mailto:maychet31@gmail.com)

Nabin Chandra Dey

*Assam University, Silchar, India*, [nabincdey@gmail.com](mailto:nabincdey@gmail.com)

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# **Genetic Counseling in India: A Bibliometric Study**

## **Abstract**

This study aims to analyze and visualize the contribution of Indian researchers in “genetic counseling”. PubMed and JGate databases were used as sources to retrieve the required data for six years, which was published between 2015-2020 (February). The data were assessed on the following parameters, growth of research publications authorship and publication patterns frequently used keywords. The study also identifies core journals and active institutions in India publishing genetic counseling research. Analysis of data was restricted to only journal articles; other types of documents were excluded. Microsoft Excel and VOSviewer software were used for data analysis. Collected data were analyzed and presented in the form of tables, charts and graphs for interpretation.

**Keywords:** Bibliometrics, Genetic Disorder, Genetic Disease, Genetic Mutation, Indian Contribution.

## **1. Introduction**

Genetic is the study of the features or characters passing from one generation to the next generation. The characters and features that are passing consists of the healthy as well as the unhealthy gene. With the development in the medical field, it has been found that a single affected or unhealthy gene that is being transmitted to the next can be a cause of a major disease for future life. So, to professionally advise about the rising or change in a human's body or mind, a term called Genetic Counseling has been given. Genetic counselling is a tool that spreads the knowledge of genetic diseases. It assesses the risks for an individual or family, analyses the medical and family history, identifies the pattern of inheritable diseases, and helps

society provide appropriate genetic services. India is regarded as one of the most populated countries with various types of diseases. In this alarming situation, genetic disease has also played a role in it. Disorders like sickle cell anaemia cannot occur unless both the mother and father pass along the genes. Still, others disorder such as achondroplasia may either be inherited or the result of a genetic mutation. Because of the high birth rate in India, a considerable number of infants with genetic disorders are born per year, almost half a million with malformations. Factors that give a high chance to these include consanguineous marriages, high birth rate, and a lack of genetic counselling knowledge (Chawla, 2018). The last few decades have witnessed immense growth in knowledge, bringing genetics from darkness to a front position in healthcare. As a result, genetic diseases both rare and common may be treated to some extent.

The research publication is one of the essential mediums for communication and can be considered a significant component for evaluating research outcome in any field. Bibliometric analysis is the most popular and widely used technique to map research productivity. The term bibliometrics was first used by Alan Pritchard in 1969 and described it as the application of mathematical and statistical methods to books and other media of communication. It is conducted to analyze the growth of literature in a particular field. It also identifies the pattern of author, sources of information, subjects, geographical origin of the information and citations. Thus, it helps in the measurement of all forms of recorded information. With the growth and development of information in every field of disciplines, information is scattered in different forms of documents and development in research activity needs the proper information. So, to analyze, the criteria bibliometric is the most valuable and popular field in library and information science.

Genetics research is proliferating, and the role of a genetic counselor is of utmost importance. Various works are being carried out, which paved the way for a number of research articles in genetic research in India. This paper intends to make a bibliometric study of genetic counseling-based literature on India listed between 2015 to 2020 (February).

## **2. Literature review**

The literature review is one of the important tools for a researcher. By studying the previous related literature, it helps the researcher to gain more knowledge. Following are some literature reviewed in this aspect. **Gupta and Bala (2011)** carried out their research on malaria in the national and global context. The data for the study was collected from SCOPUS for the time duration of 1998-2009. Data revealed Indian scientists published 2786 papers in malaria research, the USA as the most productive country and India as the 4th highest publishing country. In India, nine subject areas in this field were found, among which medicine marked as a major area. National Institute of Malaria Research, New Delhi, marked as a major contributing institute in the nation and the top 29 journals are found in this field, where 13 are of Indian origin. Thus, Indian research output is high, and it can also be further improved by encouraging more to participate in global international collaborative projects.

**In their study, Arya and Sharma (2012)** said that veterinarian scientists prefer to research in collaboration. Subject analysis showed that veterinarians have a greater interest in the field of Veterinary Physiology and animal nutrition. Researchers have performed the bibliometric study on the authorship trends and collaboration in veterinary science articles published in different journals and abstracted in CABI from 2006 to 2010 all over the world with special indication to India. The study reveals that the average degree of collaboration was found 0.84,

indicating dominance of collaborative research over solo research and literature growth shows Indians contributed 12,012 papers out of total 97,740 papers during the time interval.

**Meena (2013)** in her paper entitled “Indian Research Output on Malaria: A Bibliometric Study using Scopus Database” has highlighted the research output in malaria research. She has used Scopus database and keywords Indian and Malaria. The study reveals the growth of literature in this field, major organisations working on it and the authorship productivity.

**Vijayalakshmi (2014)** in her Ph.D. thesis entitled “Remote Sensing- A Bibliometric Analysis” reviewed the growth of remote sensing literature, citation pattern, Indian contribution, chronological growth, country wise, language wise distribution, type of document by using Scopus database and carried out the bibliometric analysis.

**Ramakrishnan and Thavamani (2015)** in their study discussed about the Indian contributions in the field of Leptospirosis covered in the bibliographic database MEDLINE. During the study period of 2006-2013, database found 714 records of Indian Literature in which 2006 has recorded highest contribution with 23.53%. Study showed that 67.65% i.e. 483 out of 714 record of all the cited records were “journal articles” and all of them were in English language. Indian Journal of Medical Microbiology was marked as core journal in India contributing 98 article and the most frequently cited records are in the subject of general medicine. The results of the Activity Index indicating above 100 shows that Indian efforts in Leptospirosis research are greater in 3 years out of 8 years of the study period.

**Singh, Handa, Kumar and Singh (2016)** in their article “Mapping of breast cancer research in India: a bibliometric analysis”, they have identified the bibliometric analysis on breast cancer research in India. They have used Scopus database for the collection of data between

2005 to 2014 considering English language journals for this time interval. They have analysed year wise distribution of paper, authorship pattern, core journals. The identification of core journals has been done by applying Bradford law of scattering and author productivity is examined using Lotka's law.

**Kumar (2017)** in his work studied about the growth and development of Library Consortia literature in periodical during 1990-2016 published by Emerald. Data of the articles published were extracted from the 26-peer reviewed journal and book series of emerald database and then filtered in MS-Excel 2010. Data revealed that research paper category was widely used in comparison to other form where 1999 was the most productive year with 14.02 % followed by 2003 and 2014 with 8.41% and 7.48% respectively of the total articles. Between 1990-1992 and in 1994 no literature was published. Journal analysis showed Interlending & Document Supply Journal covers the major number of literatures. 23 countries contribution was found where USA being in to productive country and India in 10th position. Single author publication constitutes majorly and citation pattern reveled 0-10 dominates over other.

**Sharma, et.al. (2018)** in their article "A bibliometric analysis of the published road traffic injuries research in India, post-1990" highlighted about the road traffic injuries publications during 1991 to 2017. Bibliometric analysis has been done by using Scopus for data collection. The study shows the highest publications, cited articles, top journals and top institutions on RTI research.

**Ram (2019)** studied the Carpal tunnel syndrome (CTS) which is a disease caused by compression of the median nerve passing through the wrist. He carried out with an objective to analyze research progress on CTS based on the literature published during the last 35 years

i.e. 1983 to 2017 from database record of SCOPUS yielding 13187 articles during the study period. Data revealed that scientific publications on CTS have been increasing with an annual growth rate of 9.86% per year. U.S.A is the most productive country where as India ranked 18th with a 1.44% global share each in international collaboration, publications, citation count, and h-index. 163 papers from India accumulated a total of 1734 citations with average citation 10.64 citations per paper. Journal of Hand Surgery American Volume marked the most productive journal. The study further reveals that females have a higher incidence of occurrence than males. Ram concluded that CTS is a work-related disease, as a large population around the globe working on computer or keyboards like computer or laptop or other technology have been reported to be having CTS.

**Vellaichamy and Jeyshankar (2020)** analyzed the productivity of the Journal of Ornithology using Scopus database for the time duration of 2000-2015 and filtered the data in Microsoft Excel 2007. As per the analysis it found that 1353 research papers were published during the time period where 2012 recorded highest articles. Majority of the contributions were contributed by three authors, Wink, M., from Institute of Pharmacy and Molecular Biotechnology, Heidelberg University, Germany contributed the highest number of publications. Highest number of papers was in the form of article with English was the most predominant language and amongst country Germany contributed in majority.

### **3. Objectives of the Study**

- i. To determine the growth of research production in genetic counseling in India.
- ii. To ascertain year wise and institutions wise quantum of journal articles.
- iii. To identify the authorship pattern in genetic counseling publication.

- iv. To identify the frequently used journals.
- v. To construct and analysis of term using VOSviewer software.

#### **4. Methodology**

For this quantitative study of genetic counseling, articles were downloaded based on bibliographic data from Pub Med and J-Gate databases. The timespan of 2015-2020 (February) was used and the search strategy yielded 226 journal articles, which were used for further examination. The VOSviewer software (<https://www.vosviewer.com/>) was used for keyword analysis. All the collected data were entered in the MS Excel Sheets and sorted to find the required results.

#### **5. Scope of the study**

The study emphasizes on the bibliometric analysis of contribution of Indian researchers in the field of genetic counseling. It includes the literature growth study of India's contribution indexed in PubMed and JGate databases for the period of six (06) years from 2015-2020.

#### **6. Analysis and Discussion**

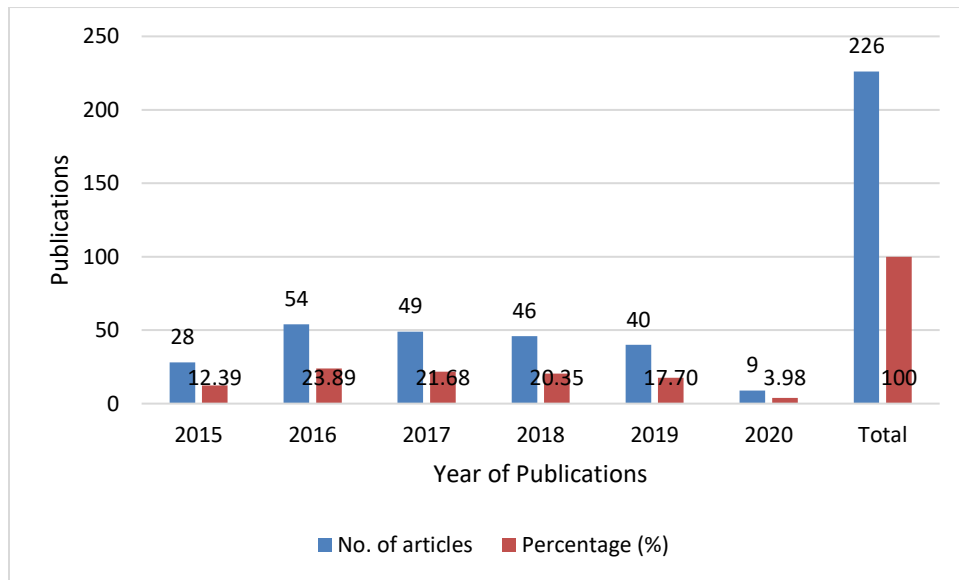
##### **6.1 Growth of the literature**

This table shows the contribution of articles from India. From the table we can say that during the taken time period 226 articles have been indexed. The highest major publication has been done in 2016 with 54 articles contributing 23.9% of the total. While next highest has been followed with 49 articles in 2017 and the third highest is 46 articles in 2018. It is also found that after 2016 the annual growth rate is negative.



**Table 1: Year wise distribution of articles**

Year	No. of articles	Percentage (%)	Annual Average Growth Rate (%)
2015	28	12.39	--
2016	54	23.89	48.15
2017	49	21.68	-10.20
2018	46	20.35	-6.52
2019	40	17.70	-15.00
2020	9	3.98	-344.44
<b>Total</b>	<b>226</b>	<b>100</b>	<b>-54.67</b>



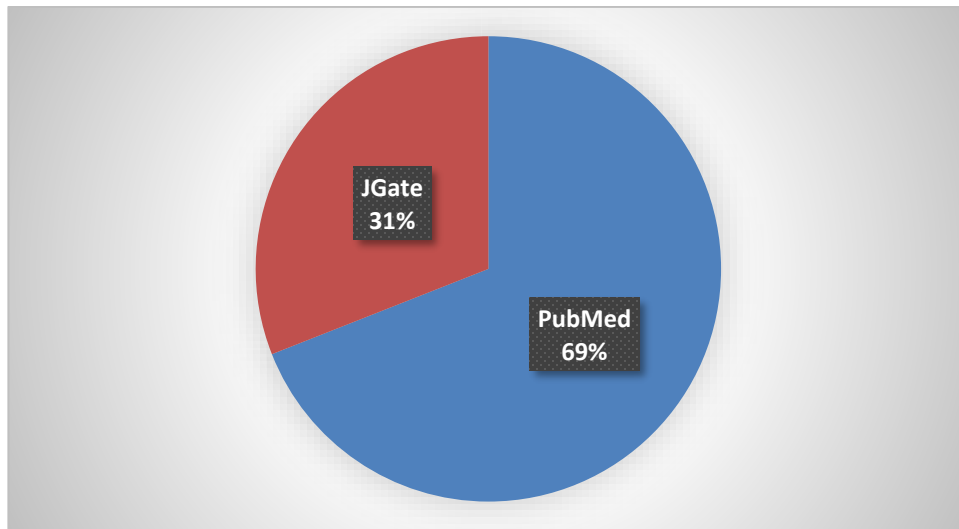
**Figure 1: Year wise distribution of articles**

## **6.2 Database wise distribution of publications**

Database shows that major publication in the field of genetic counseling is covered by PubMed i.e. 69.03% while JGate has covered 30.97% of the publication.

**Table 2: Database wise distribution of publications**

Database	Publications	Percentage
PubMed	156	69.03
JGate	70	30.97
<b>Total</b>	<b>226</b>	<b>100</b>



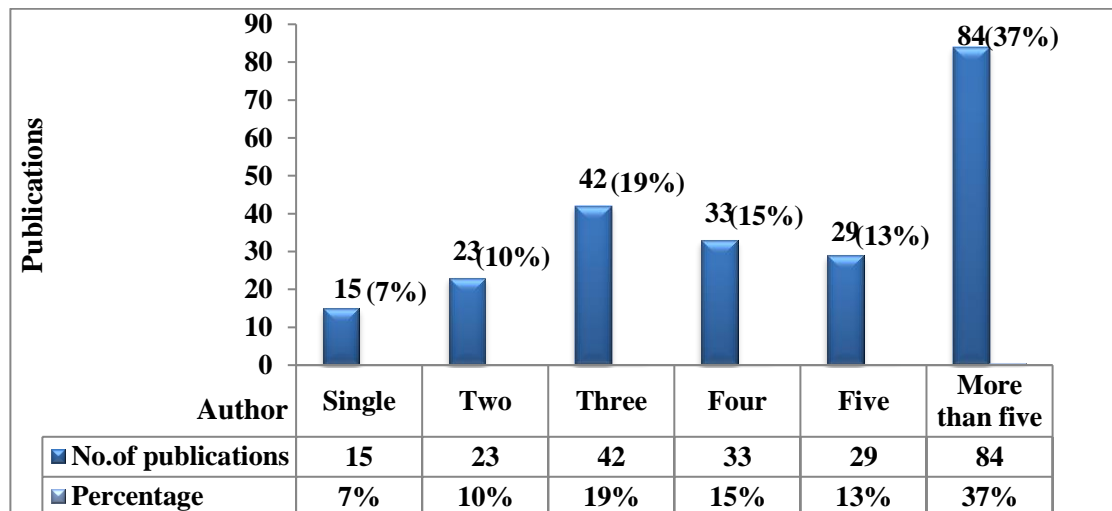
**Figure 2: Database wise distribution of articles**

### **6.3 Authorship pattern**

Table 3 data shows that only 7% of Indian research article on genetic counseling appeared as individual author publications. Remaining 93% of publications are collaborative in nature. 10% articles are by two authors and 19% are by three authors. Next 15% and 13% articles are by four and five authors respectively. 37% of the articles are authored by more than five authors. It may be due to collaborative research.

**Table 3: Authorship pattern**

Sl. No	Authors	No. of publications	Percentage
1	Single	15	7
2	Two	23	10
3	Three	42	19
4	Four	33	15
5	Five	29	13
6	More than five	84	37
	<b>Total</b>	<b>226</b>	<b>100</b>



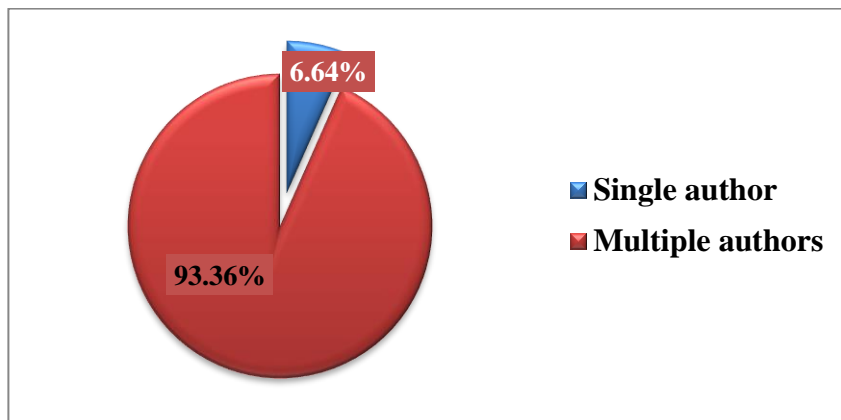
**Figure 3: Authorship pattern**

#### **6.4 Single v/s multiple author**

Table 4 shows the single v/s multiple authors research output. It is evident from the table 4 that major work is done by multiple authors in this field.

**Table 4: Single v/s multi author**

Sl. No.	Authorship pattern	Publications	Percentage
1	Single author	15	6.64
2	Multiple authors	211	93.36
	<b>Total</b>	<b>226</b>	<b>100</b>



**Figure 4: Single v/s multi author**

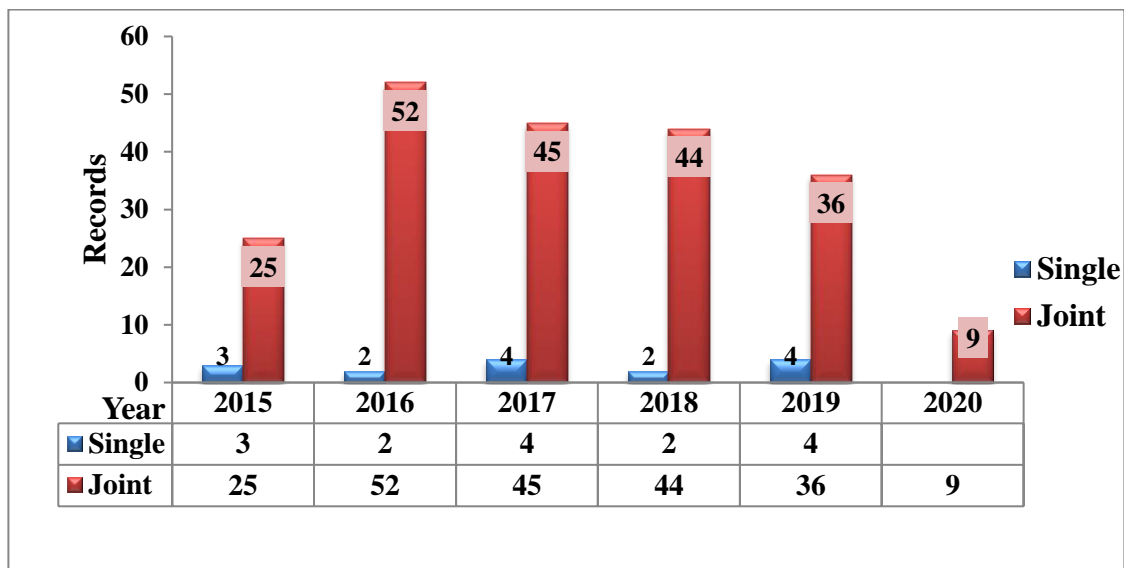
### **6.5 Year wise authorship pattern**

The table 5 examines the year wise authorship pattern which shows majorly in the year 2016 joint authors have published research output.

**Table 5: Year wise authorship pattern**

Sl. No.	Authorship	2015	2016	2017	2018	2019	2020	Total
1	Single	3	2	4	2	4		15
2	Joint	25	52	45	44	36	9	211

	<b>Total</b>	<b>28</b>	<b>54</b>	<b>49</b>	<b>46</b>	<b>40</b>	<b>9</b>	<b>226</b>
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**Figure 5: Year wise authorship pattern**

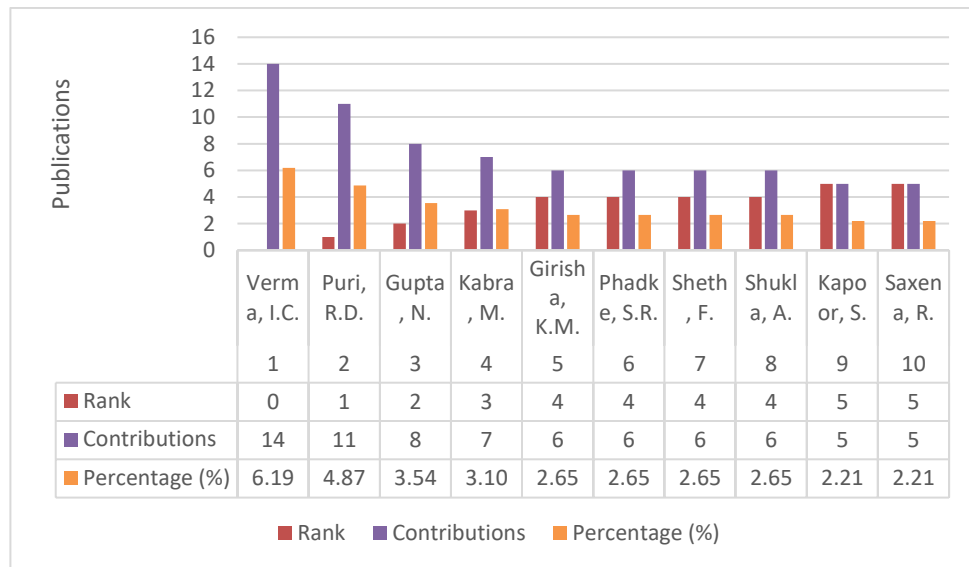
## 6.6 Top ten most prolific authors with rank

Table 6 indicates ranking of authors by their number of publications. Authors “Verma, I.C.” published the highest number of 14 publications, followed by “Puri, R.D.” published the highest number of 11 publications, next author “Gupta, N.” published 8 publications. “Kabra, M.” published 7 papers, while four consecutive authors published 6 article each. Next two consecutive authors published 5 paper each.

**Table 6: Top 10 Prolific Authors**

Sl.no	Author	Rank	Contributions	Percentage (%)
1	Verma, I.C.	1	14	6.19
2	Puri, R.D.	2	11	4.87

3	Gupta, N.	3	8	3.54
4	Kabra, M.	4	7	3.10
5	Girisha, K.M.	5	6	2.65
6	Phadke, S.R.	5	6	2.65
7	Sheth, F.	5	6	2.65
8	Shukla, A.	5	6	2.65
9	Kapoor, S.	6	5	2.21
10	Saxena, R.	6	5	2.21



**Figure 6: Ranking of authors**

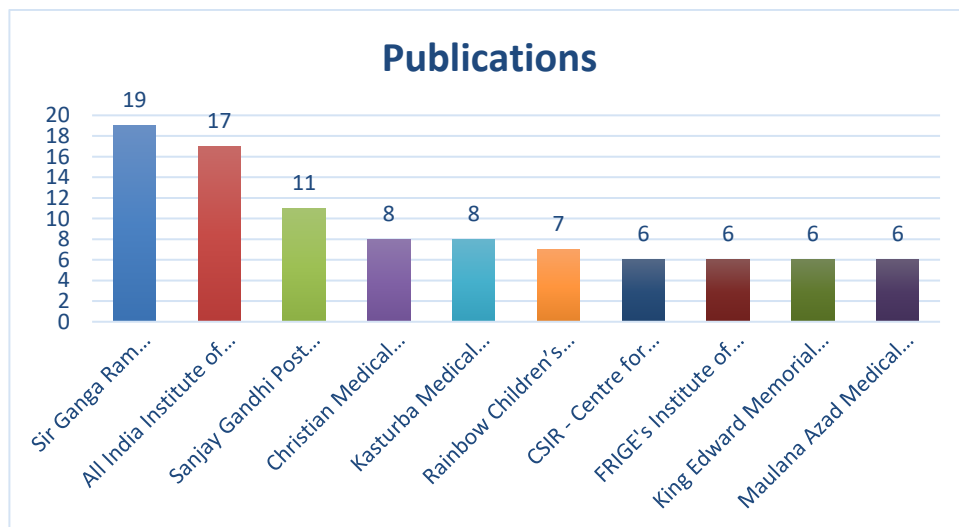
### 6.7 Top ten corporate authors

The top 10 Indian corporate authors are listed in Table 7. It has been found that 198 Institutes have done research work on the genetic counseling in India. It is noted that “Sir Ganga Ram Hospital, New Delhi” has done major output in this field followed by “All India Institute of Medical Sciences, New Delhi” and “Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, Uttar Pradesh” institutes and followed by other institutions. In

order to avoid long list of institutes, only top ten institutions' contributions are listed in the below table.

**Table 7: Top 10 corporate authors**

Sl. No	Name of the institution	Publications
1	Sir Ganga Ram Hospital, New Delhi	19
2	All India Institute of Medical Sciences, New Delhi	17
3	Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, Uttar Pradesh	11
4	Christian Medical College, Vellore, Tamil Nadu	8
5	Kasturba Medical College, Manipal University, Manipal, Karnataka	8
6	Rainbow Children's Hospital, Hyderabad	7
7	CSIR - Centre for Cellular and Molecular Biology, Hyderabad	6
8	FRIGE's Institute of Human Genetics FRIGE House, Ahmedabad, Gujarat	6
9	King Edward Memorial Hospital, Mumbai, Maharashtra	6
10	Maulana Azad Medical College and Lok Nayak Hospital, New Delhi	6



**Figure 7: Top ten corporate authors**

### **6.8 Most Productive (Core) Journals**

There are all total 143 Journals, which have published 226 articles. The top most journal has been occupied by “Journal of Clinical and Diagnostic Research” which has published 13 articles contributing 5.75% of the total publication. Next is followed by “Indian Journal of Pediatrics” and “Indian Pediatrics” securing second and third rank by contributing 4.87% and 3.1% of journals respectively.

**Table 8: Rank list of journals**

<b>Rank</b>	<b>Journal names</b>	<b>No. of articles</b>	<b>Percentage %</b>	<b>Cumulative No. of articles</b>	<b>Cumulative Percentage %</b>
1	Journal of Clinical and Diagnostic Research	13	5.75	13	5.75
2	Indian Journal of Pediatrics	11	4.87	24	10.62
3	Indian Pediatrics	7	3.10	31	13.72
4	Indian Journal of Ophthalmology	5	2.21	36	15.93
5	International Journal of Research in Medical Sciences	4	1.77	40	17.70
5	Journal of Reproduction and Infertility	4	1.77	44	19.47
5	Ophthalmic genetics	4	1.77	48	21.24
5	PloS One	4	1.77	52	23.01
6	American Journal of Medical Genetics. Part A	3	1.33	55	24.34
6	Annals of Indian Academy of Neurology	3	1.33	58	25.66
6	BMC medical genetics	3	1.33	61	26.99
6	Indian Journal of pathology and microbiology	3	1.33	64	28.32
6	Journal of evolution of Medical and dental Sciences	3	1.33	67	29.65



6	Journal of Fetal Medicine	3	1.33	70	30.97
6	Journal of Human Genetics	3	1.33	73	32.30
6	Journal of human reproductive sciences	3	1.33	76	33.63
6	Journal of Obstetrics and Gynecology of India	3	1.33	79	34.96
6	Neurology India	3	1.33	82	36.28
6	scientific reports	3	1.33	85	37.61
	Journals with 2 papers each	34	15.04	119	52.65
	Journals with 1 paper each	107	47.35	226	100
<b>Total</b>		<b>226</b>	<b>100</b>		

### 6.9 Subject wise distribution of articles

The articles that have been published are distributed in 42 sub-field wise distribution of papers.

Table 9 shows the sub field subjects which highlights that the subject “Genetics” constituted the highest record with 77 (34.07%) articles. It is followed by “Pediatrics” with 45 (19.91%) number of articles then “Pathology” with 25(11.06%) articles. There only eight subjects on which 10 or more than 10 publications have been written. Thus, the main drive on research in the topic seems to be in the field of Genetics.

**Table 9. Subject wise distribution of articles**

Sl. No	Subject	Record count
1	Genetics	77
2	Pediatrics	45
3	Pathology	25
4	Neurology	15
5	Biochemistry	11
6	Obstetrics & Gynaecology	11
7	Ophthalmology	11
8	Radiology	10
9	Medicine	9

10	Oncology	9
11	Community Medicine	8
12	Endocrinology	8
13	Fetal Medicine	8
14	Cardiology	5
15	Molecular Biology	5
16	Anatomy and genetic diseases	4
17	Biostatistics	4
18	Biotechnology	4
19	Endocrinology, Diabetes and Metabolism	4
20	Neonatology	4
21	Orthopaedics	4
22	Reproductive Biology	4
23	Anesthesiology	3
24	Cytogenetics	3
25	Dentistry	3
26	Dermatology	3
27	Haematology	3
28	Nephrology	3
29	Periodontology	3
30	Zoology	3
31	Bioscience	2
32	Pharmacology	2
33	Physiology	2
34	Psychology	2
35	Radiotherapy	2
36	Transfusion Medicine	2
37	Food and Nutrition	1
38	Maternal and Reproductive Health	1
39	Nuclear Medicine	1
40	Pediatrics and Preventive Dentistry	1
41	Preventive and Social Medicine and Public Health Administration	1
42	Urology	1

### 6.10 Cluster analysis of keywords

Figure 8 represents the cluster of keywords of genetic counseling research which were constructed using VOS viewer software. “VOS viewer” is a freeware software which established relation between authors, citation, keywords co-occurrence, bibliographic

coupling etc. and creates maps based on bibliographic data and present the relation in the form of maps. Cluster analysis shows the connection between different keywords. In this cluster analysis, genetic counseling had appeared 12 times, followed by India and genetics occurred 6 times each.

### Figure 8: Cluster Analysis of Keywords

The analysis undertaken in the present study revealed that 226 articles had been indexed from 2015 to 2020 (February) in PubMed and JGate. The finding of research productivity shows that the highest publication was done in 2016 with 54 articles, followed by 49 articles in 2017 and 46 articles in 2018. The highest numbers of the articles are authored by more than five authors, where majorly in the year 2016, joint authors have published the highest number of research output. Sir Ganga Ram Hospital, New Delhi, has done major output in this field,

ranking first at the Indian level. A total of 143 journals have been recorded, in which the Journal of Clinical and Diagnostic Research ranked first. Indian contributions are found in 42 different fields, and the Genetics field has the highest count with a maximum of 77 records.

Thus, it has been observed that only a small number of research articles on genetic counseling were available. India is considered a developing country, so facilities for education and research in new emerging branches are not fluently flourished. While undertaking the topic, the researcher has found less record in the most reputed search engine. This is perhaps indicative that less emphasis has been placed in this field. It is necessary to focus on the areas of genetics. Studies on bibliometrics are concerned with the data from databases, journals, institutions, various research outputs of authors. The present study conducted has also carried out on these points to know the impact of research in this particular field.

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